

C. H. Miller.

ON THE
VALUE AND CULTURE
OF

ROOTS

FOR

STOCK-FEEDING,

BY

David Landreth & Sons, Philadelphia,

Third Edition, 1880.

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INTRODUCTION.

In 1872, we printed for private presentation to our customers, correspondents and friends, a pamphlet entitled, "What we know about Turnips." The purpose was to use it as a means to draw more general attention to a branch of husbandry—root culture, not sufficiently appreciated as we believed, in this country. That purpose was fully expressed in the introductory remarks, some extracts from which we here reprint:

"This pamphlet is printed in the hope of diffusing useful information to induce greater attention to a most valuable adjunct in husbandry, and, if more widely regarded, calculated to increase, not only the quantity, but the quality of our food; the tender luscious mutton of the English is not attributable to their cooler climate alone, but to the Turnip; and, we may add, other succulent roots on which the sheep are fed and fattened for the butcher.

"The value of succulent food, in a hygienic or sanitary view, to man, and also to the animals which minister to his wants, need not be commented on. All who have paid attention to the subject agree in opinion as to its advantage, indeed, absolute necessity, if the preservation of health be properly studied. The long winters of our country which arrest vegetation, and oblige us to provide green food to be stored up in anticipation of the severe season, have necessarily induced inquiry and examination as to the class of vegetables which can be produced in greatest abundance, at least cost, with least exertion, in the shortest space of time, and with least liability to failure of the crop under unfavorable atmospheric conditions, and also as of primary importance,

with a capacity for preservation for months with slight danger of decay.

"In Great Britain the culture of bulbs, more especially the Turnip (in which we here include the Ruta Baga or 'Swede,' though not so classed in England), has assumed really gigantic importance; and it has been estimated by writers on political economy, years ago, when the Turnip product was much below the present, that its annual value was equivalent to the sum represented by the interest on the national debt,—no inconsiderable amount, as everybody knows. Until the culture of roots, as they are termed, was extended and enlarged in England, animal food was a luxury seldom within the reach of the operative classes, with whom vegetables and farinaceous compounds, not always of the best quality, were the reliable resources for sustenance. Now meats in some shape are within reach of all—the factory operative, the industrious mechanic, the tradesman and the wealthy land-holder, alike participate; and this change has grown out of, not national prosperity or increased wages—though both are indirectly affected—but the greater breadth of land in root-culture, which has so largely, immensely, it may be said, augmented the productive capacity of the acreage under plough,—thus practically bringing nutritious food to every working-man's door.

"Indian Corn—with us the great meat-producer, which has played so important a part in the civilization of our country, enabling the hardy emigrant from the older settlements to wrest the wilderness from the savage, and overcome the forest—is not a product of Great Britain or any portion of the north of Europe; there being known only as an import from our country. In this particular, we have an advantage impossible to estimate; but, great as it is, it should not lessen our exertion to produce *succulent food*, which augments the value of the farinaceous."

The suggestions, recommendations and facts therein stated apply with equal force now, as then; and may, we hope,

impress themselves on the attention of the youthful farmer who has started in the agricultural curriculum since the first publication of our pamphlet. Though we had ourselves from long experience, and our special pursuit in life, appreciated the importance of the subject discussed, and started out with the purpose to impress others, we had, we are free to confess, but faintly understood the popular interest in the matter, and the desire for information entertained by the country at large, as evinced by the demand from every quarter. One hundred thousand copies of the pamphlet having been consumed in editions which followed in quick succession. Besides this large number emanating directly from ourselves, it was re-printed entire in at least two rural journals, and freely quoted by the agricultural press generally.

To satisfy the still existing demand a further edition is now required, and with the wish to make it additionally useful we have appended a few remarks on other roots than Turnips, valuable for stock feeding; with illustrations which may serve to convey an intelligible idea of the appearance of the roots themselves.

The principal succulent and saccharine roots, besides the Turnip, raised for cattle-feeding are, it is almost unnecessary to observe, mainly comprised by the tribes of Beets, Carrots and Parsnips—there are some others, but they are hardly of sufficient importance to occupy space in our limited pages. We shall consider these tribes, or classes, in rotation, and briefly scan and compare the relative merits of each, where labor is the expensive item.

In this country the Turnip, and *par excellence*, the Ruta Baga (or "Swede," as it is familiarly called in England) will be, it is probable, ever more generally cultivated for stock-food than any other root—not that it is the best, but because it can be so readily grown, and at small cost. Whilst Beets, Mangolds, Carrots, etc., demand an entire season to mature, the Turnip is of so quick growth in our climate

that within a few weeks only after sowing abundant supplies may be in hand.

We cannot, however, but maintain that though at some increase of labor in the production, no expenditure on the farm may in the long run pay better than an annual crop of Beets and Carrots, even if raised only in sufficient quantity to alternate with the Ruta Baga; and thus *vary the food*, which the milch cow, the stall-fed ox, and the sheep crave equally with man.

At the present time, when foreign demand for American beef and mutton is looming up, giving promise of a new outlet of gigantic proportions for a branch of our native husbandry, practically unknown and not anticipated until recently, the subject of *Stock-feeding* presents itself with increased force.

If what has been said herein shall direct attention to means and methods in aid of a great national interest, we shall have been amply compensated for our humble effort. The subject is one which concerns the Union—our prosperity cannot advance faster than our progress in agriculture—whether as planters, grain-producers, stock-breeders or dairy-men. When they prosper all industries participate. The railroads, the mills, the forges, the shipping find profitable employment—all are subordinate to the farmer's industry.

DAVID LANDRETH & SONS.

BLOOMSDALE SEED FARM,
near Philadelphia, June, 1877.

THE TURNIP.

For many years we have, in our various publications, especially "The Rural Register and Almanac," given expression to our conception of the value of roots as stock-food. Our own working stock on our several seed farms at present numbering seventy-six head, and a small herd of Channel Island cattle kept for the family dairy, we aim as regularly to supply with food of that character, whether it be turnips, mangolds, carrots, or beets, as with hay; and we should consider it most unfortunate if untoward events should deprive us of the ability thus to contribute to the health and vigor of our working force, or the secretion of rich milk, and correspondingly rich butter, as high-colored in winter as that from grass, and almost as well flavored.

That Turnips, singly and alone, will secure health, and strength, and rich milk we are far from maintaining; but we do contend that, in proper proportion, in suitable condition, at proper times, mixed with corn-meal, shorts, oil-cake, or other farinaceous food, they will produce invaluable results. To feed roots of any kind in imprudently cold stables, or, what may sometimes be seen, in the open air in inclement weather,—the roots, perhaps, partially frozen,—and expect favorable results, argues, to say the least, want of reflection; and where we find people say, as we sometimes do, they "can see no good in roots," we are sure to find, on inquiry, that some of the obviously rational and necessary rules of procedure in feeding had been disregarded. The experience of such people should never be taken as safe guides; but rather let us pin our faith on the systematic and successful, who use the right means to the right end. One such practical, observing, methodic man in a neighborhood is worth a dozen who make no progress.

METHOD OF PREPARING THE LAND FOR TURNIPS.

The preparation of the soil is an important pre-requisite to success, both as respects the productiveness of the crop, and its cost, for it is manifest that, however valuable and desirable may be any object we seek, the cost of obtaining may be disproportionate to its value; such is especially the case with the products of the soil. The Agricultural Department of a previous day (we are sure its present head will commit no such blunder) took great credit for the introduction, as it was termed, of the tea-plant from China, though it was in our country fifty years before, and had produced perfect seed. A little reflection might have convinced the Department that, unless we could import the Asiatics, also, and they could be content to live on rice, and work for a few "cash" a day, as at home, we had better continue our tea plantations abroad. The fruits of the tropics and Southern Europe we shall successfully cultivate, for we have every climate; but the tea, never.

Some farmers with us of Pennsylvania, when laying out their Corn ground, attach to it so much land in addition as they propose to crop in Ruta Bagas and Turnips; plough it at the same time as the corn land, and whenever that crop is harrowed or cultivated, the proposed root land receives like attention. At first this may seem a waste of labor, but it can be readily perceived the finer tilth such practice is calculated to effect, but especially the economy of labor when the seed is sown. With each previous movement of the soil a new surface was exposed, and with each the latent seeds of weeds had opportunity to germinate, and were destroyed, thus slaying thousands of formidable enemies of the turnip crop. Now, all this may seem a small matter to some farmers, but we take leave to tell them that, system and method in farming, as in manufactures and other industrial pursuits, will hereafter alone pay; the increasing cost of labor, and all else incidental to the culture of the soil, must make intelligent,

methodic field labor indispensable. Slip-shod tillage will certainly bring men into debt. It is true the process described above cannot be observed under all circumstances, as in the South, where turnips are frequently grown with most success within the boundary of the cow pen, but, even there, several ploughings might be given preparatory to the seeding.

TIME OF SOWING.

In the latitude of Philadelphia, we begin to think of sowing Ruta Bagas about the 10th of July, and, if everything is in readiness, make our first sowing by the middle of the month. The process is thus: Plough the land level, harrow crosswise and lengthwise, getting it into fine tilth, then draw shallow furrows $2\frac{1}{2}$ feet apart (3 feet is better where there is plenty of room to spare); in these furrows the manure is spread; it may consist of any fertilizing material within reach. Of course decomposed matter is the best, whether it be vegetable or animal; and here, we remark, it is a good plan to prepare in advance a compost, which will readily disintegrate when spread. Where such is not at hand, any of the approved commercial fertilizers may be resorted to, but be sure and buy only from parties of good repute. When the fertilizer if a super phosphate (or other commercial manure, at about equal cost), at the rate of 500 pounds per acre, has been spread, it is a good practice to remove the hind teeth from an ordinary cultivator so as to adapt it to the width of the furrow, and pass it over the fertilizer, thus incorporating it with the soil. That done, the soil removed in forming the furrows, and a little more obtained on the opposite side is returned. This process will be found to form a ridge some inches higher than the level of the adjacent land. As that is not desirable in our climate, where heat and drought prevail rather than excess of moisture, as in England, from whence the practice of ridging is derived, we back down the ridges until they are

nearly level, and which brings the seed about to be sown near the manure, so important to stimulate the young plants. Everything being now ready for sowing, with an approved drill, made to open the furrow, deposit the seed, close the furrows, and roll in the seed if necessary, we proceed to sow. The drill should be adjusted to sow not less than two pounds of seed per acre if in drills or rows, $2\frac{1}{2}$ feet apart,—not that so much seed is necessary, if any considerable percentage vegetates, and escapes the fly, the scorching sun, and other unfavorable influences. It is probable that, if eight ounces of seed could be evenly distributed, each grain germinate, and finally succeed, there would be a sufficient number of plants to the acre; but it would be a very unwise procedure to stint the seed to save (for the present moment only) the pocket. The English, to whom we look for instruction in root-culture, use much more than two pounds per acre, but the turnip has been so generally grown in their country for generations, that the "fly," fed and pampered, has become a most formidable pest; so much so that great difficulty is sometimes found in securing a "stand."

The "turnip fly" just referred to is a jumping beetle of greenish-black color and about the tenth of an inch in length, sometimes so destructive as to devour every plant before the farmer is aware that the seed has sprouted. This active little insect, of the same order as the more familiar squash bug, hibernates in protected places, and from early Spring to Autumn produces a rapid succession of generations. The mature insects apparently reveling upon the marrow-like material of the cotyledons and first two or three pairs of leaves of the turnip and other cruciferous plants, deposit eggs upon the leaves, which, in a few days, suffer as much from the attack of the unseen larvæ as from the parent.

The remedies, which are only palliative, are thick seeding, dashing with sulphur or plaster, light application of

carbolic or whale oil soap, &c., and when all have failed or about to fail, resowing in fresh ground.

A wet season is prejudicial to the rapid growth of the fly, and with a rich soil the young plants soon acquire the third pair of leaves, which with those succeeding are proof against further injury.

If the sowing, which we have just described, should by any accident have failed, pass along the ridges a spike-tooth harrow to destroy any weed seeds which may have sprouted, and resow, as before. If from the time lost, it may be deemed too late to perfect a crop of Ruta Bagas with certainty, it may be better to make the resowing with flat turnips, which mature in a shorter season. Supposing the sowing a success, allow the plants to reach the rough or second leaf, then proceed thus: Taking a light steel hoe in hand, and standing so as to bring a corner of the hoe in an oblique direction with respect to the line of plants, and near to them, the operator walks backwards, drawing the hoe gently, and lightly skimming the surface of the soil, and with it all young weeds which may have sprung up cotemporary with the crop; returning, the opposite side of the row or drill is taken, thus leaving only a narrow line of turnip plants, nearly free from weeds. After a few days, when they have grown somewhat stronger, and are too rank for the fly to injure seriously, they may be "clumped," which is performed by taking a sharp, light, steel hoe of suitable size, say two inches wide, and standing facing the row, cut crosswise, so as to leave clumps of plants at intervals of five inches. At first the operator will cut timidly, fearing to destroy too many; but in a little while he will have gained courage, and proceed with increasing speed. It is surprising with what celerity such work may be performed by an *expert*, which any one may become with an hour's practice. We have boys who can pass along a row, cutting as they go, at half the usual walking speed. When the plants left in clumps have fully recovered from the dis-

turbance which is unavoidable, and again stand erect, the process of "singling" commences; this is simply pulling out with the finger and thumb and casting aside all but the most promising plant in each group or clump.

After the lapse of a few days, when the selected plants have become upright and self-sustaining, a very shallow furrow may be cast from each side,—the earth thus removed meeting in a ridge between the rows. If the weather is damp they may stand thus a few days, each day adding greatly to their strength; but if the weather be hot and dry, it is better to proceed at once with the hoeing, which done, the ridge of earth is to be leveled down by a spike-tooth harrow, or, in its absence, a cultivator with well-worn teeth, taking care not to cast the earth upon the young plants. This process of ploughing from the plants, and cultivating immediately after to return the soil, will need to be repeated several times during the season of growth; indeed it may be practiced with great advantage so long as the space between the rows is not obstructed by foliage, on each repetition inserting the plough deeper than before. Thus the crop will at length stand daily increasing in vigor and bulk, until the time arrives for placing it in winter quarters—in the latitude of Philadelphia not later than the 20th November.

METHOD OF SAVING FOR WINTER FEEDING.

The English, who are our instructors in this branch of husbandry, and have taught us most of what we know on the subject, have some advantage in climate over us of Pennsylvania, though not of the South, which admits of feeding the bulbs as they stand in the ground, as well as under cover,—the stock, especially sheep, being grazed upon them, using hurdles to confine the flock to a limited space. A flock destined for the butcher being first turned in, where they may feed upon the better portion, then moved into a fresh enclosure, thus enticing the appetite. These are suc-

ceeded by a store-flock, which picks up the fragments so that nothing is lost. This process corresponds with that of our prairie farmers, who turn their beef cattle into the standing corn (to us of the East, a bad practice), and follow by hogs, which we are told, find every stray grain; and aid in preparing the land for the succeeding crop.

In our country where a five-acre patch of Ruta Bagas cannot be found within some of the States, to say nothing of counties, the statement may excite surprise that a hundred acres in that root in the hands of a single farmer of Great Britain is by no means unusual; and recently the writer entertained an English farmer and stock-breeder making a tour in this country, who himself cultivated 250 acres in roots annually! Of course such large breadths demand every mechanical device and appliance for saving the crop, and instead of, as with us, each bulb destined to be stored being pulled up singly by the hand, and cast into a heap, then again taken in hand and topped, again cast into a heap preparatory to being hauled away, they, on the contrary, top with a hoe. A light, sharp, steel hoe is held perpendicularly in hand, and with a quick action drawn horizontally, thus decapitating each bulb in succession as it stands in the ground. This done, they are drawn out and into windrows by a chain-harrow, an English implement which we have in use at Bloomsdale. It can be readily seen with what celerity this labor may be performed, and the great saving in cost. With our small patches we can get along, however, by the old time-honored practice; with increasing breadths of land in roots will come improved methods. We have adopted some already: instead of topping all the bulbs of the crop, we haul a portion just as pulled up, top and bulb, to a convenient position near the stables, place them in a narrow ridge-like form, and cover with straw, corn-fodder, or any light, trashy material which may be at hand. Thus they are preserved until New Year or longer, using from one end, and covering up after each removal. We have pur-

sued this plan for many years. It is true, in warm, damp weather the tops partially decay, and become somewhat slimy, but the bulbs do not take harm, and cattle feed on them, and the tops, also, with much avidity. Perhaps a little salt sprinkled on each mess would be an advantage.

For milch cows it is recommended to give salt when feeding turnips, and the better time is immediately after milking.

The main winter and spring stock of bulbs we preserve in pits, not mounds, as made in some localities—narrow pits, after this fashion: Select a suitable spot, near the stables if practicable, but surely where the drainage is good, an indispensable pre-requisite; dig a trench sixteen inches wide, and as many or more inches in depth, the length as convenient or necessary. In this deposit the topped bulbs, and cover with the earth dug out of the trench, using a little more in addition as winter approaches. If cold may be expected in severity, place over all long stable manure, or anything which will impede the entry of frost, without creating warmth. Thus we have found roots of all descriptions—*Ruta Bagas*, Common Turnips, Carrots, Beets, Parsnips—to keep well. They are accessible at all times, and may be removed in larger or smaller quantity as needed or desired. Altogether, it is better than mounds, which being elevated are exposed to frost, and require care in construction. In the pits described we annually keep beets and carrots far into the spring, indeed we have fed our working oxen with beets, to their great delight, up to July 1st.

From what has been said, it may be seen with us theory and practice go hand in hand: we are simply describing our own operations at Bloomsdale; not telling what may possibly be done, and, satisfied with the utility of our practice confidently recommend it to others. Our experience with roots has been gained through many years, and stated in various publications, especially the RURAL REGISTER AND

ALMANAC published by us since 1847, and of which upwards of 600,000 copies have been called for in a single year.

The culture of the turnip in this country now, as compared with half a century ago, to which the memory of the writer as applied to agriculture extends, has greatly widened and enlarged. Then, it was unusual to find more than a garden-patch, except where grown for city supplies by market gardeners ; and a few hundred pounds of seed filled the measure of demand. Now we have, while these lines are being written, on Bloomsdale and its dependencies and tributaries, which embrace lands owned, occupied, and operated by ourselves, two hundred and fifty-eight acres planted in turnips of various kinds, destined to produce seed, and fast ripening for the sickle. It is true this breadth probably embraces no inconsiderable percentage of all the land in similar culture within the Union ; for the fact may not be generally known that the seeds of Turnip, especially *Ruta Baga*, as sold by metropolitan seed merchants are, to a great extent, imported from England, where the low price of labor and the much greater yield of seed per acre (on the average double that in this country) admits of production at less cost than here. That the quality is not so good does not always, as it should, enter into the calculation. And why, it may be asked, is the quality inferior to the American ? Simply by reason of climate. The humid atmosphere of England induces vigorous growth of foliage, and the longer season for the crop, the seed there being sown latter end of May, and early in June, enables the plants to attain a higher development than known with us. If a Pennsylvania farmer, who never saw a *Ruta Baga* over five or six pounds in weight, were told that 100 bulbs weighing a net ton of 2000 pounds is not unusual at a county show in England, he would probably doubt, but it would nevertheless be true ! A product of 30 or 40 tons to the acre being of common occurrence. This tendency to foliage preparatory to bulbing, is exhibited here by English seed, and if the season were long

enough would doubtless be an advantage; but our climate does not admit of spring sowing, and when made frequently late in July (other turnips than Ruta Bagas in August) there is not time to profit by the habit—*there is plenty of foliage, but imperfect bulbs.* With home-grown seed, on the contrary, nature kindly steps in and adapts the plant to our season and climate—*the foliage and bulbs being in proper relative proportion.* Some years ago, owing to a failure in our crop of Flat Dutch turnip seed, we obtained from England one hundred bushels of the “snow-ball”—there an approved garden-turnip. On trial, it proved to produce tops only—not a bulb; and the importation had to be cast away as worthless. We had previously seen similar results with what are known as cattle-turnips. These criticisms do not, however, apply with equal force to the English Ruta Baga, which, many times, succeeds quite well; though it must be admitted there is great tendency to elongated crown—“neck” as technically called; hence *we never sell the imported Ruta Baga Seed except when the failure of our crop makes it necessary, and no other variety of turnip do we ever import, under any circumstances.*

ON THE VARIETIES OF TURNIPS.

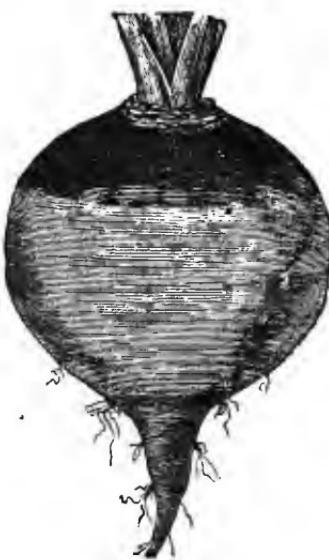
In England turnips are divided into two distinct classes—those designed for stock feeding, and those for table use. They are also divided into rough-leaved, and smooth-leaved. The smooth-leaved embrace those of which the Ruta Baga or “Swede” is the type, and of which the purple-topped, yellow-fleshed variety may be taken as the best representative. The rough-leaved sorts are generally white-skinned, and white-fleshed, some purely white, others with green or purple crowns; though there are also several rough-leaved varieties with yellow flesh. These rough-leaved sorts are again sub-divided into cattle, and table turnips; in the usually limited culture in this country such distinction is of little consequence.

The Purple Top Yellow Ruta Baga, or "Swede," is perhaps the most important root cultivated for stock food; its rapid maturity, large bulk to a given area, nutritious quality, and sanitary properties commend it as eminently worthy of culture.

It has become a practice in the sale of Ruta Baga seed to create varieties; and in an English catalogue before us there are not less than twenty-one sorts enumerated; the distinctions in a majority of cases are ideal. Last year we tested, side by side, twenty-two sorts, so-called, imported for the purpose. Many were of irregular form. In some of them, the purple tint of the crown was more marked than in others; some were green topped, some of deeper yellow flesh, but the general aspect was similar, as they stood in the ground.

The Bloomsdale Purple Top Yellow Ruta Baga of which we offer seed is the result of long years of patient, critical selection, and on comparison carefully made with intent to determine and secure the best, it was proved to be unquestionably the most desirable. The foliage is not super abundant (as in the imported), the shape is nearly globular, the crown deep purple, the flesh a rich yellow. We invite the closest observation of this variety, certain our commendations will be sustained by results.

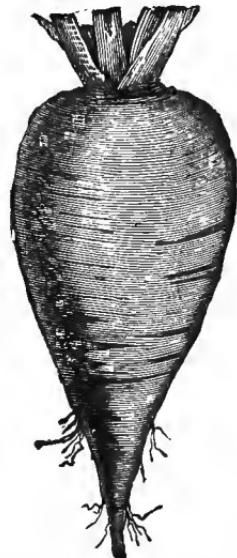
Strap-Leaved Yellow Ruta Baga.—We offer this season a very attractive variety of *garden* Ruta Baga under the above name. It has remarkably smooth skin, not quite so rich in color as the "Bloomsdale," not so globular, but of finer flesh,



Purple Top Yellow Ruta Baga.

and having little foliage is well suited to garden culture, for which we recommend it to the notice of our customers.

White-Fleshed Ruta Baga.—This mainly differs from the “Swede” in color. For table use some families prefer it to the yellow, as milder; others prefer it because it is white, as contra-distinguished from yellow. It possesses all the good qualities of the yellow, and where there is a preference for color it can be commended.



Hanover, Long French or Sweet German.

Hanover, Long French, Sweet German, Chou Navet.—Under all the above names is to be recognized *one and the same variety* of Turnip, cultivated exclusively for the table; and our experience as seedsmen establishes the fact it is rapidly growing in popular favor, more especially as a late winter and spring variety; in the autumn and early winter it is apt to be hard, but mellows like an apple by keeping.

To have this variety in perfection long after your neighbor has ceased to have a Turnip on his table, we will let out a secret: At the approach of Winter, when about to pack them away, cut off the tops so close as to remove with them a portion of the crown, thus effectually preventing the root from sprouting, and thus keep within the bulb all the gelatinous-like quality of the Turnip, which is lost by the process of sprouting, leaving not much else behind but tasteless fibre; then dig in a dry spot a trench one foot wide and two feet deep, the requisite length to hold the roots on hand; fill up with roots to one foot of the surface, restore the earth taken out, and as the weather grows colder add more earth, so as to effectually exclude frost; thus this variety may usually be kept till June. Observe, when drawing the daily supply, to keep the air excluded from the trench as much as possible.

All of the preceding varieties are of the smooth-leaved class—quite distinct in general appearance from the following, which have invariably rough leaves.

Pomeranean White Globe.—This is a free-growing rough-leaved sort, useful for both table and stock, and may be highly commended for both purposes. We have succeeded in establishing a strap-leaved variation, and now offer it to the public as an acquisition of value. Turnip cultivators need not hesitate to sow it, whether the purpose be for stock, market, or family use; it is not quite so rapid in growth as the flat varieties; may be expected to come in as a succession in autumn, and is admirable for table use in early winter. In short, the "Pomeranean Globe" is eminently valuable, and supplies every want of a white-skinned turnip, *more robust in habit* than the Early Dutch. It eclipses the "Norfolk" and the "Stone."

Amber Globe, of which we also offer of our own introduction a strap-leaved variety, is an Americanized foreign turnip, almost indispensable, we think, in every rural household. The flesh, when the turnip is in growth, is very slightly tinged with yellow, which grows darker as the root matures; it is as solid as a ruta baga, and if topped very closely, so as to effectually arrest sprouting, they may be kept until late in spring, as good as when first pulled. The flavor **Amber Globe (strap-leaved).** is milder than that of the ruta baga, therefore by some

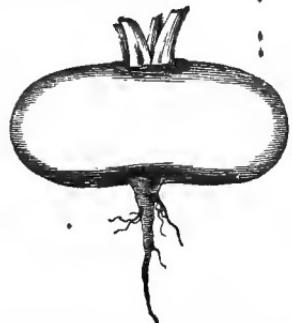


Pomeranean White Globe (strap-leaved).

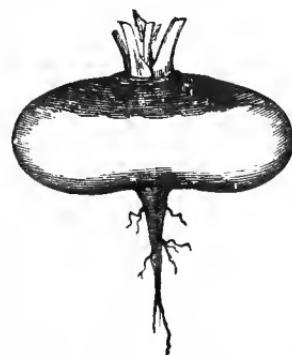


Amber Globe (strap-leaved).

more esteemed. On the whole, this is the best type of the yellow, rough leaved sorts, and fills every want in that direction.



Early Flat Dutch (strap-leaved). This is the popular *early* turnip for table use. It might be difficult to sum up the volume of seed of this variety (which in a strap-leaved form also originated on our own grounds) that we have distributed in a series of years. It has made its way over the entire continent; has been exported to India and Australia, and some years back, strange to say, was returned to us from Europe, under the auspices of the Patent Office, as an English variety! For autumn and early winter use, this and the purple-top are highly popular, but as they become over ripe with age and in keeping lose somewhat of their succulence, need to be succeeded by the Pomeranian Globe or the Amber Globe.



Red or Purple Top (strap-leaved)

The Flat Purple-top (strap-leaved) is so nearly akin to the Early Dutch, differing only in the color of the crown, that its appearance with that exception, quality and habit may be said to be identical; both are of remarkably quick growth, the bulb sets flat upon the surface of the earth, the foliage sparse in comparison with size of bulb, thus admitting of close culture.

The Seven-Top Turnip of the South.—This, the hardiest of all sorts, may be left standing in the open ground during winter as far North as Philadelphia. It yields in the spring abundant foliage for boiling with cured meats, which must

necessarily be relied upon in warm climates, and the anti-scorbutic character of the turnip top is well recognized. The bulb of this variety is of but little value, indeed is worthless in comparison with others herein described.

Cow Horn.—To meet an occasional demand we have added this variety to our standard list. It is certainly a delicate, good flavored sort, and grows in favor. Its best season is the Autumn and early Winter, as it is likely to decay towards Spring.

Yellow Aberdeen or Scotch Yellow.—Is a highly approved cattle turnip, attains a large size, is solid, nutritious, a good keeper, and is in every respect reliable. There are several types under distinctive names, without much variation in quality.

We are apprehensive full justice to this variety has not been done by us in previous publications; further observation and experiments with the Aberdeen, raised from seed produced from *Americanized bulbs*, inclines us to speak more favorably than heretofore. It is well adapted to cattle-feeding, and for table use also, late in winter and far into the spring, when the earlier ripening varieties have grown pithy.

A friend exhibited to us at mid-winter a sample of butter made by him, which he assured us was the result of Aberdeen Turnips raised from our seed, and corn-fodder *only*, no farinaceous food whatever having been fed. The butter was of a deep lemon tint, sweet, well-flavored, and would have commanded at that time 60 to 70 cents per pound in the Philadelphia market; we must not, however, fail to add, his stock was the Channel Island or Alderney. His method was to feed the roots, well salted, immediately after milking, as



Yellow Aberdeen.

many as each animal felt disposed to eat; thus treated, there was no turnip-flavor perceptible, either in the milk or butter.

To enumerate only the sorts, nominal and otherwise, printed in some catalogues, would occupy a page. We see no advantage in such extension, and shall here close our list. He who seeks only the better sorts need look no farther.

THE BEET.

UNDER this head American farmers embrace all roots with certain characteristics, whether they be for table use, stock feeding, or sugar making. What principally interests at present is the question which is best for Stock Food; though we shall also refer to the sorts cultivated as Garden Beets—and here we may observe, that, in no country is the table beet so generally used as in this; elsewhere its principal purpose seems to be as a garnish, or decoration to other dishes:—here it is used as a pickle at all seasons, and in summer may be seen on the table of nearly all families as a vegetable dish, plainly boiled, and served with butter sauce.

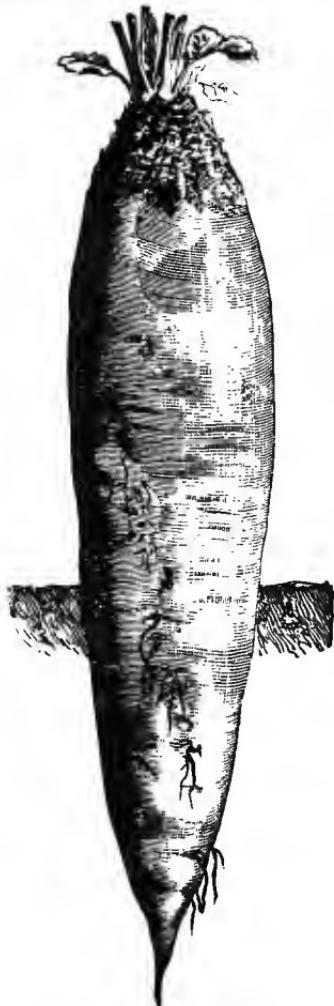
As preliminary to further remarks on beet culture, let us say the first question to be solved by every farmer is as to his command of necessary force to accomplish with reasonable prospect of success what he may desire, and whether he can devote a full season's attention to the crop; or can more profitably use the time in other directions, relying on a crop of Ruta Baga, and other Turnips for succulent food, which, though not as nutritious, may be raised at less cost of time and labor.

It is emphatically with root culture as it is in all other operations on the farm, a simple question of dollars and cents, and if food less nutritious may be obtained in quantity to compensate for deficiency in quality, the inferior may be preferable. Ruta Bagas judged by that rule may be most

profitable. Each one must decide the question for himself. Where circumstances admit there need be no doubt, the greater advantage will be found in possessing both, as affording variations of diet.

VARIETIES.

MANGEL WURZEL.

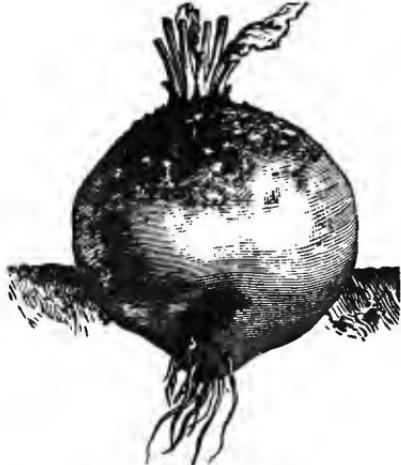


Long Red, or Mammoth Long Red.—There are several sub-varieties of the Long *Mangel*, known as the Long Yellow, Long Ox-horn, Long White green topped; but we shall here confine our notice to the one of which we annex an engraving, inasmuch as it embraces all the good qualities of others, and there can be no advantage in dividing attention between it and other sorts of similar shape and properties. The one referred to has long been cultivated as *the Mangel Wurzel par excellence*.

Long Red Mangel Wurzel.



Red Globe Mangel Wurzel.



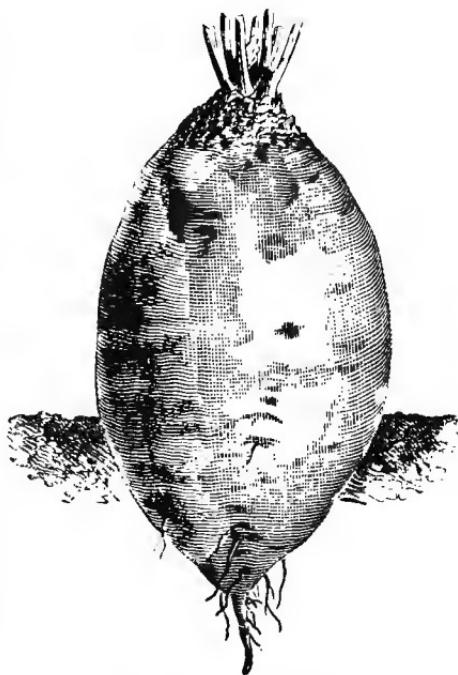
Yellow Globe Mangel Wurzel.

Red, and Yellow Globe Mangel.—Here we have two types of this root, each possessing very similar qualities, indeed, the distinction is mainly in color; and hence simply a matter of fancy in the cultivator.

For facility of harvesting the crop the globe form has an advantage over the long, as is evident at sight; and a further and possibly more important advantage is the smaller waste in fibrous neck, and we are not sure but there is less liability to suffer in extreme drought,—an important consideration in our climate.

Yellow Oval. — This variety has much to commend it, and is destined, we think, to command a large share of favor. It is a productive variety raised with great success at Bloomsdale, and we shall continue to plant for our own supply.

The Long Yellow and Long White Mangels are still retained in the catalogues of seedsmen, but we give the preference to either of the sorts specifically described above.

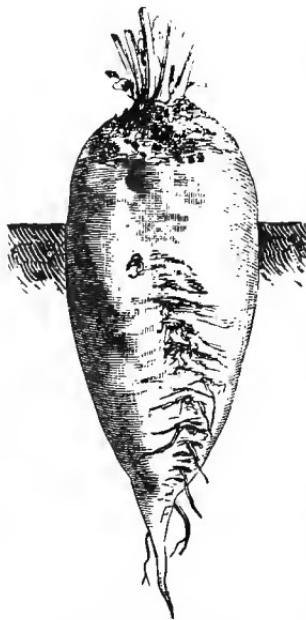


Yellow Oval Mangel Wurzel.

Imperial Sugar Beet. — This, it is claimed, is the most productive of the Sugar varieties, though there cannot be much difference between it and the following, except they give a greater yield of matter with less percentage of saccharine.



Imperial Sugar Beet.



Silesian Sugar Beet.

Silesian Sugar Beet. This is the old well-known form of sugar beet long raised in this country for feeding, and is the variety mainly cultivated abroad for sugar. Heretofore the great effort has been to obtain the largest bulk of root food from a given area, and where a primary object is to supply merely succulent food as distinct from dry, there is great gain in quantity. Recent chemical analysis has demonstrated that the percentage of saccharine in the large roots falls below that of the smaller, and where the primary object is sugar, cultivators no longer aim at large roots, but rather those of medium size well matured:—hence it follows that in feeding for flesh or for butter the smaller roots in proportion to the weight fed will accomplish greater results. Those who desire further information on the subject of beet culture for sugar may consult Stammers' *Jahresbericht*, or other works among the numerous European publications upon this interesting subject.* The Beet owes its fattening influences principally to the saccharine matter contained in it. This varies according to variety of root, manure, soil, and climatic influences. The production in Germany in 1874-75 averaged one ton of sugar to each eleven tons of roots. When fed to animals the entire proportion of sugar is realized, and produces wondrous results.

* Also, see Appendix to this pamphlet page 41.

Long Blood Beet.—For many years our practice at Bloomsdale has been to grow full supplies of this variety for stock food in preference to any other Beet.

It is held to be as rich in saccharine as either the sugar or the *Mangels*, with the further highly important advantage from its habit of growth, which all who as husbandmen study our climate can readily perceive, namely of withstanding drought. In our climate excessive heat accompanied by prolonged drought is a usual accompaniment of our summers, and all who have cultivated either the *Mangels* or *Sugar Beets* have observed the entire suspension of growth at such periods, the foliage drooping, frequently falling entirely, and followed by an elongated crown or a growth of woody, or at least fibrous matter. This substance is of but little if any value—rejected by the stock it simply goes to make manure. On the contrary the *Long Blood Beet*, to which we here invite special attention, grows mainly beneath the surface, and is on that account less exposed to heat and enabled to resist drought. We have never failed to secure a satisfactory crop even under adverse circumstances—besides the *Long Blood* is pronounced to be very rich—the percentage of saccharine being as great as in the *White Sugar*, which latter is simply preferred by European cultiva-



Long Blood Red Beet.

tors, because of the larger production per acre, and the greater facility of gathering, by reason of the elevated crowns, and by sugar makers because of freedom from natural coloring. For stock feeding purposes the color is of no importance, and the elevation of the crowns in our heated atmosphere is an objection so serious as to more than counterbalance the labor of gathering the crop.

So important do we consider the subject of the cultivation of the Beet in its various forms, that we give the following as our process of preparation of the soil, and after-culture.

The soil selected should be a light loam, free from hard clay, and if of a slightly calcareous nature, so much the better; plow *deeply*, when the apple is in blossom as a guide to the season, later the crop may be overtaken by drought, harrow thoroughly, furrow out to a depth of eight inches with a double-mould-board plow if such can be had, or if not, with an ordinary plow, casting the earth both ways. Apply in the furrow a liberal dressing of *well-rotted* stable manure, or about twenty dollar's worth per acre of commercial fertilizer, the component parts of which are strong insoluble phosphate of lime, potash, nitrogen, and sulphate of lime; we have found the best results from a home-made fertilizer, the proportions and value of which is found in the following table:

	Analysis.	Value per lb.	Quantity.	Cost per Acre.
Super-phosphate of Lime,	70%	3½cts.	100lbs.	\$ 3 25
Nitrate of Potash,	47%	13 cts.	80 "	10 40
Sulphate of Ammonia,	25%	5½cts.	100 "	5 25
			280	\$18 90

These two hundred and eighty pounds thoroughly mix with thrice its weight of fine dry earth, to facilitate more perfect distribution; the mixture costing in its manufacture and application less than twenty dollars per acre. After the application of the fertilizer run a sub-soil plow in the open furrows, breaking up the hard-pan and distributing the manure. Deep culture is a necessity to success, and the sub-soil plow the most important implement, as every

inch the soil is deepened permits the roots to draw nutriment from an additional hundred tons of earth per acre. Next, split the ridges covering the fertilizer, and transposing the relative positions of ridge and furrow, back down the new ridges nearly to the level of the field, and drill upon the flat so formed—the seed thus being placed directly over the fertilizer and broken sub-soil. If the weather be dry a roller should follow the seed drill, to insure germination. An advantage will be found in preparing the ground, applying the fertilizer and splitting the ridges a fortnight in advance of drilling, that a portion of the fertilizer may have assumed an assimilable form for the early subsistence of the young plants. A light dressing of common salt applied to the soil will be found beneficial to the beet crop, especially in dry soils. When the young plants are half an inch high they should be side scraped with seven-inch steel hoes, and then cross-cut with four-inch hoes into clumps of three or four plants—the clumps to be afterwards reduced to one plant by hand-weeding, as more fully described under the head of Turnips. This process will give about thirty thousand plants to the acre, if the stand be good.

The crop should be kept free from weeds, and the soil loose, that air and moisture may more freely penetrate to the roots. With thorough cultivation, and sub-soil breaking in mid-summer, the roots are not so liable to suffer from variations of temperature and moisture; hence the growth is more uniform, and the roots are less woody and distorted.

During the entire culture care must be taken not to injure the leaves of the plants, as with impaired lungs a healthy action is impossible.

When the roots are fully developed, and ripe, which will be about the first of October (and may be known by the stoppage of circulation), they should be taken up; if they make a second growth under certain atmospheric in-

fluences a large portion of the saccharine matter goes to form new leaves. On the other hand, they should not be disturbed before maturity, as the formation of saccharine matter is most rapid at that period. The roots can be taken out by passing the sub-soil plow under them, which, if run deep enough, will escape all but the extreme points, and the saving in time more than compensates for the loss of product.

Care must be taken in harvesting the roots that they be not bruised, those thus injured are apt to decay. The tops should be cut so closely as to remove all leaf-buds, as the dampness of the pits may cause the embryo buds to burst forth, and thus exhaust nutritious qualities.

The roots when pulled, should be pitted without delay, as described for Ruta Bagas or "Swedes." The European growers of Beets have a proverb, "Out of the earth into the earth," and with care they may be kept till 1st July.

And here, to avoid the necessity of repetition, we will say, that the foregoing remarks apply equally as well to the culture of the carrot and parsnip. Every stock-breeder should grow the Beet, in some of its varieties, as he may lay up for winter a valuable supply of this food at times when Swedes or Turnips have failed, by reason of the fly or dry weather. The Beet, though requiring earlier planting, is for that reason more reliable in vegetating, and is well established before the blazing days of July, when the turnips are just breaking ground, perhaps to be devoured by the fly. The beet-leaves may flag at mid-day, but next morning the cells are distended, the leaves crisp and full of vigor. Extensive breadths of Sugar Beets are grown in Southern Europe, where the Swede is seldom seen, at least never raised for cattle, because of the hot suns and dry soils. The beet, for feeding market cattle, is unsurpassed, and by deep pitting can be kept from season to season. By the practice of deep pitting we were enabled at the International Centennial Exhibition, May 15th to 1st June,

to exhibit twenty varieties of Beets,—one bushel of each—preserved in perfect condition, as sweet and crisp as when taken from the field in November. Also Carrots in equally good condition.

We advise our Southern readers to try the Beet, assuring them that they will realize a profit.

A crop of ten tons of beets can be produced at an expenditure varying from thirty to forty dollars. The following estimate may be taken as an approximation, soil, situation, cost of labor and fertilizers, all having, however, an important bearing upon the cost :

Rent of land.....	\$7 00
Plowing, harrowing and rolling.....	3 50
Ridging, application of manure and sub-soiling.....	3 00
Manure.....	18 00
Drilling.....	50
Thinning, weeding and hoeing.....	4 00
Three cultivations.....	3 00
Two hoeings.....	5 00
Sub-soiling between rows.....	2 00
Lifting the crop.....	3 00
 Total.....	 \$49 00

The ten tons under this estimate would cost less than five dollars a ton, or about twelve cents a bushel, and in the cultivation of large breadths the cost per acre can be reduced—while the production may be increased twenty-five per cent.

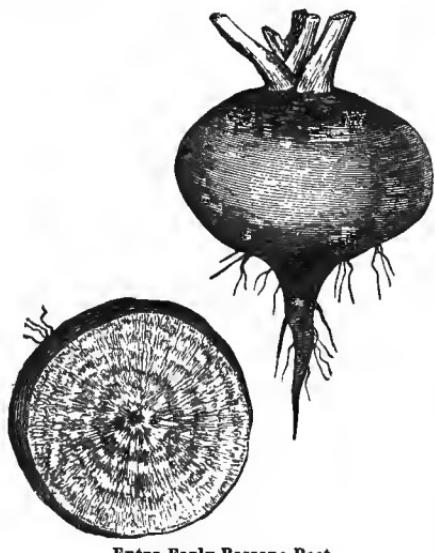
Ten tons of Long Blood Beet can readily be grown to the acre. Can anything be more profitable to the stock-breeder? In our practical operations as tillers of the soil, with seventy-six head of working stock in harness daily on our several seed-farms, it may readily be seen the subject of economic feeding has been prominent; and the several kinds of food, and methods of preparation, whether as raw or steamed, ground, chopped or plain, has called for close attention; and, our opinion, it may be inferred is plainly

practical, the result of interested observation directed to pecuniary ends.

Our annual culture of the Beet for seed is so extensive, frequently, as to yield two thousand five hundred bushels of seed—the roots producing which are cultivated and wintered as described, and set out in March for a second year's growth.

TABLE BEETS.

The following varieties of Beets, though of course valuable, so far as they go, for stock-food, are never planted as such primarily. We shall describe them in the order of maturity.



Extra Early Bassano Beet.

Extra Early Bassano.—This is, with the exception of the next following (Egyptian), the earliest sort; it is globular, sugary and tender, but being white-fleshed is not so acceptable generally as the red. To the Market Gardener it is a profitable variety, enabling him to present them to his customers in advance of all other sorts, and to the private family—not less so.

Egyptian Turnip.—This is as early as the Bassano, flesh dark red, and when first introduced was received as quite an acquisition; but further acquaintance has exhibited a serious defect—deficiency of sweetness,—its extreme earliness and approved color may continue it in cultivation, but it can never become popular.

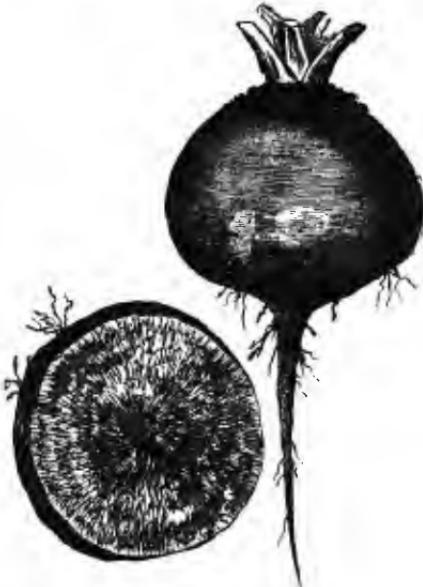
Philadelphia Early Turnip.

—This variety, which we so named and introduced many years ago, follows very closely after the Bassano, it is neither red nor white, but with alternate rings of lighter or darker pink, it boils red, and is withal, rich, tender and sugary. It is a highly popular sort, identical with the *Bastian* and *Simon* beet of some catalogues.



Philadelphia Early Turnip Beet.

Blood Red Turnip.—Here we have the old stand-by, the turnip beet with its dark red color so well known by our annual distribution to so many homesteads for over half a century. It is useless to occupy space in describing it, suffice it to say, it is the best variety for family use.



Early Blood Red Turnip Beet.

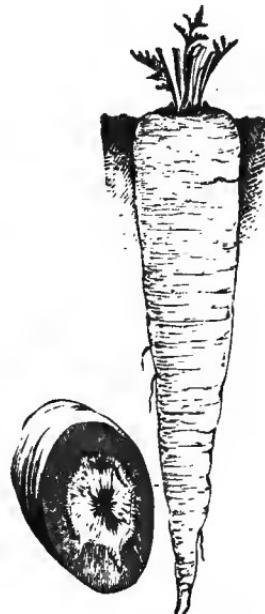
Long Blood Red.—This, the *Winter Table Beet*, has been brought to its present state of perfection by successive yearly selections. It is the sort alluded to under the head of Cattle Beets, and is known in every family. We need only remark that it is preferable, for table use, to the Rochester or Radish Beet, which grows above the surface and is liable to be fibrous.

THE CARROT.

To the dairyman whose object is gilt-edged butter during winter, commanding readily double the price of the ordinary market grade, *Carrots* we consider indispensable. They not only give the richness of sweet vernal grass to the milk and cream, but color the butter naturally—beside which all artificial methods are imperfect and unsatisfactory. To the country family which can afford the higher comforts of life, and with whom butter is not simply something so-called, irrespective of quality, perhaps lard-like in substance, flavor and color, the carrot need not be commended—it speaks its own praise.

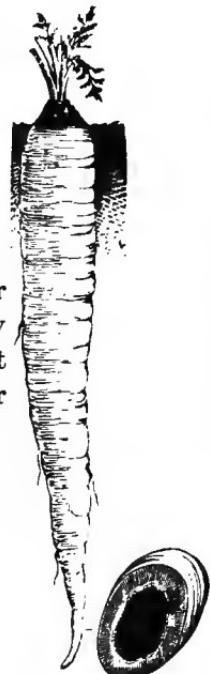
To the dairyman whose object, is *simply* milk and milk only, the Ruta Baga and the Beet may supply his wants, they can be, especially the former, produced at less cost than the Carrot, and will yield as great or even greater flow of milk, an advantage which need not be enlarged upon, and it is certain where either is fed in connection with only a moderate addition of farinaceous food, as Indian meal, in preference to all else, butter of prime quality may be obtained. Still we hold to the Carrot, where circumstances admit of its culture, as the “*ne plus ultra*.” •

THE VARIETIES.



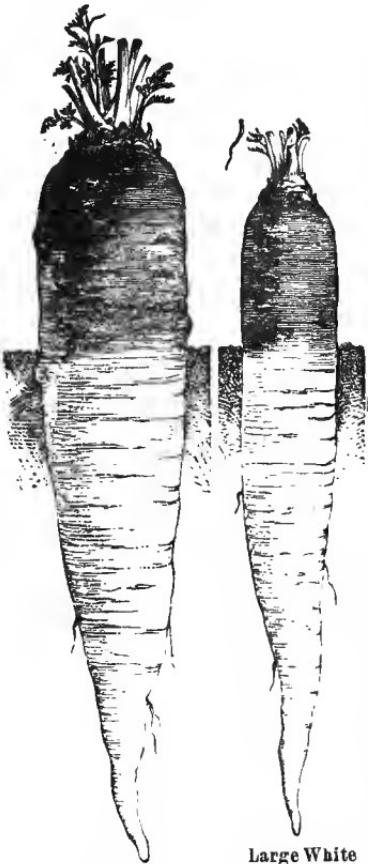
Long Orange Carrot.

Long Orange or Long Red Surry.—The same under different names is the one best known, and is well approved.



Altringham Carrot.

Altringham.—A more robust and coarser grained variety than the preceding, and may frequently make a larger yield, but it is not so attractive, and, if intended in part for market, is not so valuable.



Large Yellow Belgian
Carrot.

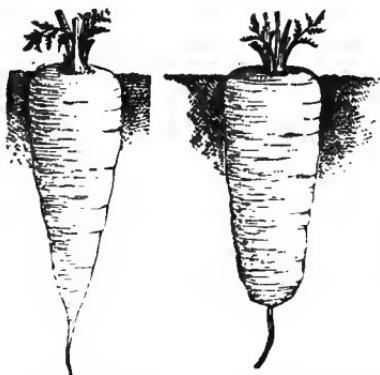
Large White
Belgian Carrot.

The Large Yellow Belgian and the Large White Belgian vary principally in color; and yield, there can be no doubt, a larger return than others. To the milk-man and to the *stock-feeder* they are worth much more than the cost of culture, promote liberal secretion of milk of improved quality over that from dry food, and may be fed alternately with Ruta Bagas and Beets, with the best results.

The stock-feeder will find them of high value. Fed to the stalled ox, or the wether being fattened for the butcher, or the ewe strengthened to nourish the early lamb, succulent food just such as the carrot gives, is indispensable. The experienced feeder will be cautious lest he overdoes the thing, and on the first evidence of failing appreciation of the special food sup-

plied will substitute some other; hence the importance of providing variety; and just here comes in the opportunity to recommend a proportion of each, Ruta Bagas, Beets and Carrots, so as to alternate as needed, each heavily dusted with Indian meal or bran, and a proper portion of salt, the roots, of course, previously prepared by washing and slicing.

The Pointed Rooted Horn and Blunt Rooted Horn differ only in shape, and are raised exclusively for table use, we refer to them simply as desirable for an early Summer supply.



Early Horn Carrot
(pointed-rooted).

Early Horn Carrot
(blunt-rooted).

CULTIVATION.

The field culture of the Carrot is identical with that prescribed for the Beet in every particular, the processes are the same, and time of sowing also. Crops of eighteen hundred bushels have been raised to the acre, and one-third of that quantity may be confidently looked for under proper conditions of soil, culture and season.

We advise the cultivator to run a sub-soil breaker upon both sides of each row, at least twice during the season of growth, especially if drought prevails, that the fibres may be better enabled to extend, and for the promotion of sub-terranean circulation. This process we also recommend for the culture of the Beet and Mangel. The cost per acre of producing a crop of Carrots (allowing twenty dollars for manure and twenty dollars for preparation and culture) should not exceed forty dollars; which at four hundred bushels would be ten cents a bushel, and at six hundred bushels less than seven cents per bushel, for a crop the profits and advantages of which need not be enlarged upon.

PRESERVATION.

The Carrot does not keep well except in cool weather, and even in winter more care is requisite than with either the

Ruta Baga or Beet. It is therefore well so to adjust the consumption of the crop that it be used up in season. The narrow trench method described and recommended on page 14 is emphatically the one for this root, above all others:—do not trust them in a cellar even, though it be cool, nor in mounds piled two or three feet high, as was, and is still, practiced.

The methodical farmer will not be alarmed at our injunction of caution—he knows it is better not to attempt anything which cannot be done well, and, having once commenced a job, the only economic course is to see it effectually accomplished.

THE PARSNIP.

The original of the cultivated Parsnip is found growing wild in England, the root white, aromatic, mucilaginous, sweet, and possessing a degree of acrimony which it loses by cultivation.

In our experiments in search of facts to be used for our own advantage in stock-feeding, and to be communicated for public good, we have from time to time raised the Parsnip for the purpose of feeding to a herd of Channel Island Cattle, but the results have not convinced us of the economy in comparison with other roots, for horned cattle. There is this advantage, however, the parsnip never rots when stored, and if work presses may be left out over winter so far north as Philadelphia without loss, thus reserving this special crop for Spring feeding.

VARIETIES.

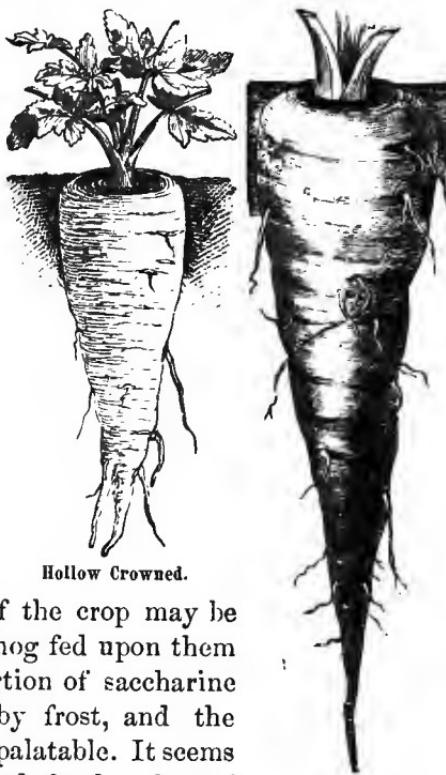
The Sugar or Hollow Crowned, is the approved table parsnip; the Guernsey is a more robust sort, usually raised for stock food.

It is said that the excellence claimed for Guernsey hams is attributable to the Parsnip, which is the main food of the hog of that island; it may be well for some one among ourselves who has the opportunity, to test the fact. In sections where frost does not interfere, a portion of the crop may be left over winter and the hog fed upon them as they stand, the proportion of saccharine matter being increased by frost, and the roots rendered still more palatable. It seems practicable, by this method, for breeders of swine to accomplish, in the Southern States, results highly profitable, in comparison with cost of culture.

We desire, with this in view, to urge the culture of Parsnip in all swine-breeding sections, the cost of the crop being simply the culture and manure—while the production can be made to reach ten tons of roots, possessing nine per cent of sugar.

TIME OF SOWING.

The seed of the Parānip, though vegetating freely under favorable conditions, not unfrequently fails when sown late, when heat and drought prevail, hence it should precede the



Guernsey.

Carrot and the Beet by some days ; a good guide to time of sowing being the blooming of the cherry.

The directions for the culture of the Beet apply to the Parsnip.

IN CONCLUSION.

Our pamphlet in which we started to tell a few facts acquired by us in our long years of practical observation as tillers of the soil, and to offer suggestions on points with which our special pursuit had made us familiar, has extended beyond its original limits; but there was found to be so much to say, the space could not well have been curtailed. Parting, as we are now about to do, with the reader, we take leave to reprint the concluding remarks in a previous edition :

“ Farming is, with Americans, in by far too many cases, a slip-shod business. The merchant, the manufacturer, the master-mechanic who should conduct his affairs with careless irregularity, indifferent to cost as compared with compensation, who should be found unprepared at the moment of pressing demands upon him, surely could not expect a successful issue to his efforts ; and why should the tiller of the soil expect exemption from results almost inevitable ? Farmers, as a class, are laborious enough, in many cases by far too plodding ; thought and reflection, united with physical exertion, would accomplish more. A fruitful source of disappointment proceeds from our attempting too much in proportion to our means ; not unfrequently larger breadths of land are designed for crops than the capital at command warrants. With the farmer, capital means laborers, manure, working stock, and numerous incidentals, and the land marked out for cropping should ever be subordinate to these. In tillage, it is by far better to do a little well, there may be profit in that ; the reverse is certain to result in loss.”

APPENDIX.

ON BEET SUGAR.

The producer of cattle-feeding Roots must needs be somewhat familiar with the Sugar Beet and its uses, and so impressed are we with the prospective advantage of Beet Sugar manufacture in the United States, that, the attention of the readers of this pamphlet is invited to the brief remarks we have to offer. We are now engaged in conducting some experiments on our farms in four different states, under distinct conditions of soil and climate, and hope to be able to present results, which will certainly be interesting and possibly of practical value.

In Europe, the manufacture of Beet Sugar has stimulated Agricultural enterprise to a wonderful extent, and is annually extending over broader territory. In fifteen years it has increased fourfold. At first the governments of France and Germany paid bounties to the manufacturers, and in addition protected them by high tariffs; now these same governments exact an internal revenue tax of from thirty-four to fifty-five dollars on every acre of roots grown, and in the face of this enormous tax, the farmers and manufacturers were never more prosperous.

The Beet Sugar made in Europe in 1875 amounted to 1,317,623 tons, a production equal to 61 per cent. of the cane sugar manufactured in the world. The internal revenue tax upon European Beet Sugar amounted in 1874-5 to over 40,000,000 of dollars.

The production of Beet Sugar in France is 2040 lbs. per acre. The amount of Cane Sugar produced in Louisiana is 1904 lbs. per acre. The gross production of Louisiana

in 1875 was only one-eighth of the amount of sugar consumed in the United States, the inhabitants of which consume twice as much per capita as those of any other country. Similar data to any extent can be furnished proving beyond cavil the profitableness of the Sugar Beet industry in Europe, and that a full demand can be found in our domestic markets for all that can be made.

The general improvements consequent on the manufacture of sugar are of inestimable advantage to the prosperity of any locality or country where it has been successfully pursued. The manufacture stimulates the production of other crops, as Beets can be grown to the best advantage only under a practical system of rotation of crops. The high manuring necessary in Beet culture results in bountiful harvests of intermediate crops. In addition, the processes of culture commencing in April and continuing till October, and those of manufacture lasting from October till April, makes an increased demand for laborers, adding to the permanent population of the district, and the supply of whose increased wants brings prosperity to others, thus completing the circle of social prosperity.

The fattening of cattle upon the cake or cellular residuum from the processes is exceedingly profitable, and stimulates the production of hay and grain—these being necessary adjuncts. The manure carefully saved, under the system of stall feeding, is returned to the lands from whence the roots were taken; and with judicious application of commercial manures the fertility of the soil is annually enhanced.

The processes of culture require improved agricultural implements, with these comes the closer observation of rural affairs, and thus the farmer is educated to habits of investigation, as well in agricultural chemistry as the general study of vegetable life.

Thus it may readily be perceived that the Beet Sugar industry is profitable to all concerned; all classes participate in the prosperity it creates and diffuses. No agricultural

pursuit is so beneficial to the community where it is carried on—the producers and manufacturers dealing directly with each other.

At a County Agricultural Exhibition in France the following significant inscription was placed on a triumphal arch:

"Before the manufacture of Beet Sugar, the arrondissement of Valenciennes produced 695,750 bushels of wheat, and fattened 700 oxen. Since the manufacture of Beet Sugar was introduced, the arrondissement of Valenciennes produces 1,157,750 bushels of wheat and fattens 11,500 oxen."

In Beet Sugar districts the proprietors of the factories, as a rule, have some hundreds of acres under their own control, and purchase additional supplies of roots from their neighbors, at prices ranging from four to five dollars a ton. A factory costing ten thousand dollars in its equipment will work up, during the manufacturing season of six months, 100 acres of roots and afford employment for ten or twelve operatives. One costing fifty thousand dollars will employ fifty men and work up annually the roots grown upon 500 acres—the annual area in roots under a four-course rotation of 2,000 acres.

The root-grower can average twelve tons to the acre, often fifteen and over. The cost of production of which should not exceed forty dollars per acre on a most liberal allowance for rent of land, manure and labor. In Europe the leaves cut from the crop when harvested are preserved for months in air-tight under-ground chambers, and are relished by cattle when fed mixed with other food.

The pressed pulp sold by the manufacturers amounts to about 20 per cent. of the weight of the roots used. It is valued at \$5 a ton as cattle food, and can be thoroughly preserved in underground vaults, or equally as well in deep trenches from which the air is excluded. This cake is looked upon as a highly valuable factor in the production of sugar;

a sixty thousand dollar factory producing cake sufficient to feed 300 head of cattle during a period of six or seven months.

Fattening stock, it will thus be seen, becomes a prominent feature in all districts where the Beet Sugar industry is pursued; and with the new markets opened abroad to the almost limitless import of American beef this feature is of increased importance.

The cultivated Sugar Beet is pre-eminently a potash plant. This element must be liberally supplied to effect good results, and though other constituent parts are equally necessary they are more likely to be naturally present in the soil, and are only required in small proportions. The potash in the ash of Sugar Beets amounting to 48 per cent.—as much as all the other constituents united. Strong nitrogenous fertilizers, though forcing the roots to large development are objectionable as they are not conducive to a high percentage of saccharine. Saline substances do not so much retard the formation of saccharine matter as its complete extraction and crystallization; an excess of molasses is thus produced—an article less profitable than sugar.

Virgin soils and others rich in vegetable mould and saline constituents cannot be expected to produce beets adapted to sugar-making purposes. Such soils may grow gigantic roots, but they are not such as are most profitable, as the manufacturer, pays the grower in proportion to the percentage of saccharine matter contained in the roots furnished. The sheet-anchors of Agriculture must always be stable manure and green crops ploughed in. Commercial fertilizers are only supplementary, though invaluable when honestly made. Stable manure freshly applied is, however, prejudicial to the free formation of sugar, and in Germany is always applied to the crop preceding the beets. The application of manures must be regulated by the soil and rain-fall, as no fixed formulae can be offered to suit all locations.

The air of the grower of Beets for Sugar should be to

secure by manuring and culture a root containing the highest per centage of saccharine matter, with the lowest per centage of salts and other foreign substances—the presence of such being an impediment to the complete extraction of the sugar. Sugar Beets to be profitable should contain not less than 12 per cent. of saccharine, and by the scientific application of manures have been made to yield 18 per cent.

The specific gravity of the juice affords a satisfactory indication of the saccharine properties ; if at 1.05 the saccharine amounts to over 13 per cent., from which 8.70 per cent. of the weight of the roots can be obtained in sugar. The following table may be assumed as a guide, and will afford opportunity to any one to make a practical investigation of the adaptability of his soil and climate to this industry :

TABLE

Indicating in an Approximate Manner the Percentage of Sugar in the Juice of the Beet-Root according to the Specific Gravity,

Specific Gravity.	Percentage of Sugar corresponding to the specific gravity, if only sugar was in the juice.	Correction. The non-sugar, the result of 50 to 60 trials.	Approximate percentage of sugar in the juice.
1.030	7.40	5.00	2.40
1.035	8.50	5.00	3.50
1.040	9.50	5.00	4.50
1.045	10.50	5.00	5.50
1.050	12.00	4.50	7.50
1.055	13.20	4.50	8.70
1.060	14.50	4.20	10.30
1.065	15.70	4.00	11.70
1.070	16.70	3.70	13.00
1.075	18.00	3.20	14.80
1.080	19.20	3.00	16.20
1.085	21.00	2.00	19.00

Baume's Hydrometer is used to indicate the specific gravity.

The percentage of sugar extracted by the German manufacturer has annually been increasing from 6 per cent. in 1835 to 9 per cent. in 1875.

If the Beet Sugar industry can be successfully pursued in this country, so as to meet simply the *domestic demand* for

sugar, the impetus to other interests would be, if not incalculable at least difficult to estimate. In that event the area of land annually under cultivation in beet roots would be 1,000,000 acres. The machinery and buildings required would be of a value of 100,000,000 dollars. 2,000,000 tons of coal would be required by the factories, and 1,000,000 dollars worth of stable manure and other fertilizers annually purchased. No agricultural interest in Europe can be compared with it in rapidity of growth or in the advantages resulting from its pursuit.

That there can be found within the Union, many sections where this industry may be profitably established, admits of no question. Preliminary experiments are needed, and the first step is to grow roots, and closely observe the influence of soil, manure, and climate, and when the roots are in proper condition procure analyses of the juice.

If the roots can be produced by the farmer in quantities of twelve tons and over per acre, and sufficiently rich in saccharine matter, and the locality be favorable as respects fuel and an abundance of pure water for manufacturing purposes, the proper conditions exist, and capital is all that is required.

The co-operative system pursued in dairy districts would be quite as feasible in the manufacture of Beet Sugar. For processes of culture the reader is referred to page 28.

